PLATELET-DERIVED EXTRACELLULAR VESICLES IN PLATELET CONCENTRATES

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Background:
Platelet-derived extracellular vesicles (PL-EVs) are present in plateletpheresis concentrates (PCs) and may influence the quality of PCs. Routine quantification of PL-EVs may be useful in the quality control (QC) of (PCs). Aims of the studies were to establish and validate QC analysis protocol and to applicate the protocol in a multicenter study as standardized PL-EV quantification using standard flow cytometers.
METHODS: In one center1, QC protocol for PCs (n=42) was validated including PL-EV analysis and functional platelet (PLT) capacity (CD62P in response to TRAP-6 activation) by flow cytometry (FCM). A hematology analyzer was applied to the determination of PLT count. All in vitro measurements were carried out on day 0 and on day 5. In the following multicenter study, 86 PCs were investigated in five blood transfusion centers (A–E) on days 0 and 5. Centers used different instruments: Trima (n=56) and/or Amicus (n=30). PCs were prepared using standard methods (sd-PCs; n= 73; A–D) or with pathogen inactivation (PI) (PI-PCs; n=13; E). PLT count, PLT-capacity and PL-EVs were analyzed in analogous application of QC protocol[1].
Results:
Externalization of CD62P, indicative for intact PLT-capacity, significantly decreased during PLT senescence in all 86 PCs ($P < 0.001$), and PL-EVs increased in 74 PCs (A, C–E; $P < 0.001$). During storage, PLT count was stable in 58 PCs (A–C, D). In contrast, 12 PCs (B) showed a decrease in PLT count and PL-EVs. Certain donor parameters (e.g., cholesterol, immature platelet fraction) were associated with lower PL-EVs. Longer apheresis time resulted in PL-EV increase. In Trima-produced PCs, PL-EVs were significantly lower (D) and PLT-capacity was superior to PCs prepared with Amicus (A, D). In PI-PCs, PL-EVs were 10-fold lower compared to sd-PCs, but similar QC-trends during storage (PL-EV increase, loss of PLT-capacity) were demonstrated for both PC-groups.
Conclusion:
Measurement of PL-EVs is highly recommended for regular QC of PCs as plausibility check of PLT condition. PL-EV analysis in a QC-program of PCs was successfully performed with results comparable among the different centers. PLT-capacity and PLT-vesiculation were primarily affected by preparation techniques.